

SUPPORT FOR THE AMENDMENTS

The specification has been amended to recite a claim of priority to related International and Italian patent applications, as set forth in the originally filed Application Data Sheet, and to include appropriate section headings. In addition, the specification has been amended to conform to the claims as currently presented. Furthermore, the specification has been amended to incorporate the International System of Units (SI units) of kPa for pressure, as converted from the non-SI units of mm Hg as set forth in the originally filed specification.

Support for the amendment to claim 21 is found at specification page 5, lines 24-25, page 6, lines 1-7, and page 9, lines 5-13, as well as original claims 5, 11 and 13.

Support for these amendments is provided by the originally filed claims and specification.

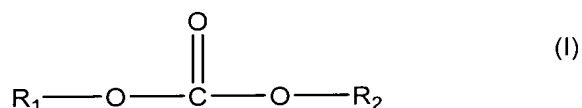
It is believed that these amendments have not resulted in the introduction of new matter.

REMARKS

Claims 21-32, 34 and 36-44 are currently pending in the present application. Claims 33 and 35 have been cancelled, and claim 21 has been amended, by the present amendment.

The rejections under 35 U.S.C. § 103(a) of: (1) claims 21-24, 28-32 and 35-38 as being obvious over Shingo (JP 11-080418) in view of Cohen (U.S. Patent 4,405,394) and Vogel (U.S. Patent 5,532,023); (2) claims 25 and 26 as being obvious over Shingo in view of Cohen, Vogel and Masahide (JP 11-005865); and (3) claims 26, 27, 33, 34 and 39-44 as being obvious over Shingo in view of Cohen, Vogel and Peters (U.S. Patent 5,232,954), are respectfully traversed in part, and obviated by amendment in part, with respect to claims 21-32, 34 and 36-44, which incorporates the limitations of claims 33 and 35 into claim 21.

Claim 21 recites a process for recycling expanded *polystyrene* comprising: volume reduction of expanded *polystyrene* by dissolution in a solution comprising a dialkyl carbonate, or a blend of dialkyl carbonates, having the following general formula (I):



wherein R₁ and R₂ are the same or different and each independently represent a linear, a branched or a cyclic alkyl radical having from 1 to 12 carbon atoms, and the sum of the carbon atoms of R₁ and R₂ is from 2 to 15; removal of an insoluble component, if present; *selective precipitation of polystyrene with a non-solvent, wherein the selective precipitation of polystyrene is carried out at a temperature of 10-70°C, wherein the non-solvent is an alkylene carbonate, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, and wherein a weight ratio of the non-solvent to the dialkyl carbonate is from 2:1 to 20:1*; separation of precipitated *polystyrene*; and drying of precipitated *polystyrene*.

Applicants respectfully submit that the Office clearly erred in concluding in the Advisory Action mailed April 20, 2009 that polystyrene is not claimed, and thus not examined.

One of ordinary skill in the art giving claim 21 its broadest reasonable interpretation consistent with the specification clearly would have recognized that the process of claim 21 is directed to recycling expanded *polystyrene*. Applicants respectfully submit that that the Office's interpretation of claim 21 and assertion that the claim language does not include polystyrene is unreasonable with respect to the plain meaning of the claim and inconsistent with the specification.

Applicants further submit that the Office clearly erred in concluding, in the Advisory Action, that the arguments set forth in the Response filed April 7, 2009 are substantially similar to the previously submitted arguments set forth in the Amendment filed September 24, 2008.

The Amendment was successful in overcoming the anticipatory rejections over each of Masahide and Shingo, as well as the obviousness rejections over Peters alone and in view of Masahide and Shingo. The references of Vogel and Cohen were cited for the first time in the Final Office Action. Applicants arguments traversing the new obviousness rejections based, in part, on the newly cited references of Vogel and Cohen were set forth *for the first time* in the Response (See e.g., page 3, lines 8-25, page 4, lines 1-14 and 19-25, page 5, in its entirety, page 6, lines 1-2 and 9-16). Therefore, the Office clearly erred in concluding that the arguments set forth in the Response are substantially similar to the previously submitted arguments set forth in the Amendment. Contrary to the Advisory Action, the Office has not substantively addressed the arguments set forth in the Response.

Applicants further submit that the Office has not established a *prima facie* case of obviousness.

Shingo, Cohen, Vogel, Masahide and Peters, when considered alone or in combination, fail to disclose or suggest the claimed process for recycling expanded polystyrene comprising carrying out at a temperature of 10-70°C selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, wherein a weight ratio of the non-solvent to the dialkyl carbonate is from 2:1 to 20:1.

Unlike the claimed invention, Shingo describes a process for recycling foamed polystyrene comprising precipitating polystyrene with a lower alcohol as the sole non-solvent (See e.g., abstract, [0011], claims 2 and 5).

Unlike the claimed invention, Cohen describes a process for laminating a photosensitive layer to a substrate in the manufacture of printed circuit boards, wherein the photosensitive layer comprises a thermoplastic polymer, wherein the substrate comprises aluminum or copper, and wherein said process comprises in sequential order: cleaning a substrate surface; applying a thin layer of a liquid to the substrate surface to form an interface between the substrate surface and the photosensitive layer; and displacing the liquid from the interface by absorption into the photosensitive layer during lamination (See e.g., abstract, column 1, lines 9-16 and 51-68, column 2, lines 1-3, column 3, lines 16-19). Cohen lists polystyrene among a plethora of various polymers that may constitute the thermoplastic polymer included in the photosensitive layer (See e.g., column 5, lines 34-68, column 6, lines 1-56). Cohen describes that the liquid may be a solvent or a non-solvent liquid, wherein non-solvent liquids may include water, fluorocarbons, aqueous and fluorocarbon solutions of alcohols, alkoxyalkanols and alkylene carbonates, and aqueous solutions of heterocyclic compounds or chelating agents (See e.g., column 2, lines 44-46, column 3, lines 8-13). Cohen describes that particularly preferred non-solvent liquids are aqueous solutions of methanol or ethanol (See e.g., column 3, lines 14-15).

Unlike the claimed invention, Vogel describes a method for reducing wrinkles on clothing fabric with a wrinkle reducing composition comprising: a silicone compound; a film-forming polymer; and a liquid carrier, wherein the wrinkle reducing composition is substantially free of starch, modified starch and mixtures thereof (See e.g., abstract, column 1, lines 5-8 and 55-63, column 2, lines 4-11). Vogel lists styrene among a plethora of various monomers that may constitute the film-forming polymer (See e.g., column 4, lines 40-64, column 5, lines 1-11). Vogel describes that preferred monomers are selected from the group consisting of vinyl alcohol,

vinylpyrrolidone, acrylic acid, dimethylaminoethyl methacrylate, ethyl acrylate, methyl methacrylate, methacrylic acid, diethylenetriamine, vinyl pyridine, adipic acid, mixtures and copolymers thereof (See e.g., column 5, lines 11-15, column 26-52, column 7, lines 38-67, column 8, lines 1-16). Vogel describes that the liquid carrier is preferably an aqueous system comprising water (See e.g., column 12, lines 54-57). Vogel describes that the aqueous liquid carrier may optionally, but not preferably, contain a low molecular weight organic solvent that is highly soluble in water, including C₁-C₄ monohydric alcohols (e.g., ethanol, propanol, isopropanol), C₂-C₆ polyhydric alcohols (e.g., alkylene glycols, polyalkylene glycols), alkylene carbonates and mixtures thereof (See e.g., column 12, lines 54-64). Vogel describes that the particularly preferred liquid carrier is distilled water, deionized water or tap water (See e.g., column 12, lines 64-67).

Unlike the claimed invention, Masahide describes a carbonate compound for dissolving polystyrene (See e.g., abstract).

Unlike the claimed invention, Peters describes a process for recovering polystyrene comprising precipitating polystyrene with an alcohol as the sole non-solvent at a temperature of 20-50°C (See e.g., column 4, lines 25-38).

Applicants respectfully submit that contrary to page 10, lines 6-8 of the Final Office Action mailed January 7, 2009, a skilled artisan would not have been motivated to combine Shingo with the *clearly unrelated* references of Cohen and Vogel. Shingo is directed to a process for *recycling foamed polystyrene*. In contrast, Vogel is directed to a method for *reducing wrinkles on clothing fabric*. Cohen is directed to a process for laminating a photosensitive layer to a substrate in the manufacture of *printed circuit boards*.

Applicants further submit that even if sufficient motivation and guidance is considered to exist for a skilled artisan to combine Shingo, Masahide and/or Peters with the unrelated references of Vogel and Cohen, which is clearly not the case, a skilled artisan would not have arrived at the process of the present invention comprising carrying out at a temperature of 10-70°C selective

precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, wherein a weight ratio of the non-solvent to the dialkyl carbonate is from 2:1 to 20:1, as presently claimed, *absent impermissible hindsight reconstruction*.

As acknowledged on page 3, line 17 of the Final Office Action mailed January 7, 2009, Shingo is silent as to the claimed weight ratio of the non-solvent to the dialkyl carbonate being from 2:1 to 20:1. A *prima facie* case of obviousness for arriving at the claimed weight ratio of the non-solvent to the dialkyl carbonate being from 2:1 to 20:1 by routine experimentation has not been established. A particular parameter must first be recognized as a result-effective variable before the determination of the optimal ranges of said variable may be characterized as routine experimentation. See e.g., MPEP § 2144.05(II)(B); *In re Antonie*, 195 USPQ 6, 8, 9 (CCPA 1977). Since Shingo is completely silent as to the weight ratio of the non-solvent to the dialkyl carbonate described therein, Shingo necessarily fails to recognize that said weight ratio is a result-effective variable that may be optimized by routine experimentation. Accordingly, a skilled artisan would not have been motivated to arrive at the claimed weight ratio of the non-solvent to the dialkyl carbonate being from 2:1 to 20:1 by routine experimentation, based on the limited disclosure of Shingo, absent impermissible hindsight reconstruction.

Contrary to the process of the present invention, which involves carrying out at a temperature of 10-70°C selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, wherein a weight ratio of the non-solvent to the dialkyl carbonate is from 2:1 to 20:1, Shingo describes a process for recycling foamed polystyrene comprising precipitating polystyrene with a lower alcohol as the *sole non-solvent* (See e.g., abstract, [0011], claims 2 and 5) and Peters describes a process for recovering polystyrene comprising precipitating polystyrene with an alcohol as the *sole non-solvent* at a temperature of 20-50°C (See e.g., column 4, lines 25-38).

Contrary to the process of the present invention, which involves selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, Vogel describes that the liquid is a “carrier” of the film-forming polymer, which is a term recognized by those of ordinary skill in the art to mean a substance that facilitates the transport or delivery of another substance (See e.g., column 12, lines 54-68).. Vogel fails to provide a skilled artisan with sufficient motivation and guidance to *particularly select* the claimed polystyrene from either the *tremendously large genus* of film-forming polymers, or the *particularly preferred* film-forming polymers, described therein. Vogel teaches away from utilizing alkylene carbonates or alcoholic blends thereof because Vogel explicitly discloses that the *particularly preferred* liquid carrier is water and that the aqueous liquid carrier *preferably does not contain* C₁-C₄ monohydric alcohols (e.g., ethanol, propanol, isopropanol), C₂-C₆ polyhydric alcohols (e.g., alkylene glycols, polyalkylene glycols), alkylene carbonates and mixtures thereof.

Contrary to the process of the present invention, which involves selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, Cohen describes that the liquid is to be “absorbed” into the photosensitive thermoplastic polymer layer (See e.g., abstract). Cohen fails to provide a skilled artisan with sufficient motivation and guidance to *particularly select* the claimed polystyrene from the *tremendously large genus* of thermoplastic polymers described therein. Cohen also fails to provide a skilled artisan with sufficient motivation and guidance to *particularly select* an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, as presently claimed, from the various solvent and non-solvent liquids, or the *particularly preferred* aqueous solutions of methanol or ethanol, described therein. Cohen also fails to disclose or suggest a non-solvent liquid comprising a mixture of an alcohol and an alkylene carbonate.

Even if a skilled artisan were to combine Shingo with the clearly unrelated references of Cohen and Vogel, a skilled artisan would not have arrived at the selective *precipitation* of polystyrene with an alkylene carbonate non-solvent or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, in accordance with the process of the present invention, absent impermissible hindsight reconstruction, because Cohen describes *absorbing* an aqueous solution of methanol or ethanol into a photosensitive layer that may comprise various thermoplastic polymers in the manufacture of printed circuit boards, and Vogel describes that water serves as a *liquid carrier* for various film-forming polymers in a method for reducing wrinkles on clothing fabric.

Applicants therefore respectfully submit that a *prima facie* case of obviousness has not been established by the Office because *insufficient* motivation and guidance exists for a skilled artisan to combine the disclosures of Shingo, Masahide and Peters with the *clearly unrelated* references of Vogel and Cohen to arrive at the process of the present invention comprising carrying out at a temperature of 10-70°C selective precipitation of polystyrene with an alkylene carbonate non-solvent, or a blend of non-solvents consisting of an alcohol and an alkylene carbonate, wherein a weight ratio of the non-solvent to the dialkyl carbonate is from 2:1 to 20:1, as presently claimed, *absent impermissible hindsight reconstruction*.

Assuming *arguendo* that sufficient motivation and guidance is considered to have been provided by Shingo, Cohen, Vogel, Masahide and/or Peters to direct a skilled artisan to arrive at the process of the present invention, which is clearly not the case, such a case of obviousness is rebutted by a showing of unexpected results.

As shown in Table 1 below, which compiles into tabular form the experimental data presented in Example 22 and Comparative Example 20 of the present application, Applicants have discovered that the process of Example 22, which involves selective precipitation at a temperature of 25°C of polystyrene with a blend of non-solvents consisting of an alcohol and an alkylene carbonate, wherein a weight ratio of the blend of non-solvents to the dialkyl carbonate is 20:1, in

accordance with the present invention, unexpectedly exhibited superior properties with respect to surprisingly enhanced efficacy in the removal of impurities during the recycling of expanded polystyrene, as compared to the inferior properties exhibited by the conventional process of Comparative Example 20, as described in Shingo and Peters, which involves precipitation of polystyrene with an alcohol as the sole non-solvent.

| Example | Non-Solvent(s) | Recycled Expanded Polystyrene | |
|--------------|-----------------------------------|-------------------------------|----------------------------|
| | | % Bromine Removed | % Dicumyl Peroxide Removed |
| Ex. 22 | n-butanol and propylene carbonate | 94 | 98 |
| Comp. Ex. 20 | n-butanol | 61 | 92 |

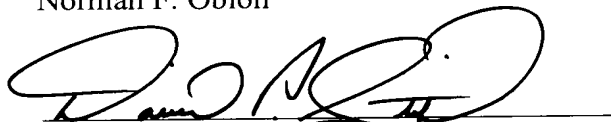
This evidence clearly demonstrates that a process involving selective precipitation of polystyrene with a blend of non-solvents consisting of an alcohol and an alkylene carbonate in accordance with an exemplary aspect of the present invention, unexpectedly exhibited superior properties with respect to surprisingly enhanced efficacy in the removal of impurities during the recycling of expanded polystyrene, as compared to the inferior properties exhibited by the conventional processes described in Shingo and Peters, which involve precipitation of polystyrene with an alcohol as the sole non-solvent.

Withdrawal of these grounds of rejection is respectfully requested.

In conclusion, Applicants submit that the present application is now in condition for allowance and notification to this effect is earnestly solicited.

Respectfully submitted,

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